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UTILITY
PATENT APPLICATION
TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No. 4090-126 Total Pages
First Named Inventor or Application Identifier
Larry C. Wilkins
Express Mail Label No. EM464406089US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. Fee Transmittal Form
(Submit an original, and a duplicate for fee processing)

2. Specification [Total Pages 19]
(preferred arrangement set forth below)

- Descriptive title of the Invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to Microfiche Appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings (if filed)
- Detailed Description
- Claim(s)
- Abstract of the Disclosure

3. Drawing(s) (35 USC 113) [Total Sheets 31]
1

4. Oath or Declaration [Total Pages 2]
 a. Newly executed (original or copy)
 b. Copy from a prior application (37 CFR 1.63(d))
(for continuation/divisional with Box 17 completed)
(Note Box 5 below)

- i. DELETION OF INVENTOR(S)
Signed statement attached deleting
inventor(s) named in the prior application,
see 37 CFR 1.63(d)(2) and 1.33(b).

5. Incorporation By Reference (useable if Box 4b is checked)
The entire disclosure of the prior application, from which a
copy of the oath or declaration is supplied under Box 4b,
is considered as being part of the disclosure of the
accompanying application and is hereby incorporated by
reference therein.

ADDRESS TO: Assistant Commissioner for Patents
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Washington, DC 20231

6. Microfiche Computer Program (Appendix)

7. Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)

- a. Computer Readable Copy
- b. Paper Copy (identical to computer copy)
- c. Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

8. Assignment Papers (cover sheet & document(s))
37 CFR 3.73(b) Statement Power of
(when there is an assignee) Attorney
10. English Translation Document (if applicable)

11. Information Disclosure Statement (IDS)/PTO-1449 Copies of IDS
Statement (IDS) Citations

12. Preliminary Amendment

13. Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)

14. Small Entity Statement(s) Statement filed in prior application,
Status still proper and desired

15. Certified Copy of Priority Document(s)
(if foreign priority is claimed)

16. Other:
.....
.....

17. If a CONTINUING APPLICATION, check appropriate box and supply the requisite information:

 Continuation Divisional Continuation-in-part (CIP) of prior application No: _____

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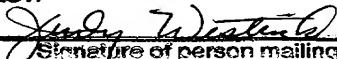
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NAME	Joseph A. Naughton, Esq.				
	Woodard, Emhardt, Naughton, Moriarty & McNett				
ADDRESS	111 Monument Circle, Suite 3700				
	Bank One Center/Tower				
CITY	Indianapolis	STATE	Indiana	ZIP CODE	46204-5137
COUNTRY	USA	TELEPHONE	(317) 634-3456	FAX	(317) 637-7561

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FEE TRANSMITTAL

Note: Effective October 1, 1997.
Patent fees are subject to annual revision.

TOTAL AMOUNT OF PAYMENT (\$ 435.00

Complete if Known

Application Number	April 16, 1998
Filing Date	Larry C. Wilkins
First Named Inventor	
Group Art Unit	
Examiner Name	
Attorney Docket Number	4090-126

METHOD OF PAYMENT (check one)

1. The Commissioner is hereby authorized to charge indicated fees and credit any over payments to:

Deposit Account Number 23-3030
Deposit Account Name Woodard, Emhardt et al.

Charge Any Additional Fee Required Under 37 CFR 1.15 and 1.17 Charge the Issue Fee Set in 37 CFR 1.18 at the Mailing of the Notice of Allowance

2. Payment Enclosed:

Check Money Order Other

FEE CALCULATION

1. FILING FEE

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code (\$)	Fee (\$)	Fee Code (\$)	Fee (\$)		
101	790	201	395	Utility filing fee	\$395
106	330	206	165	Design filing fee	
107	540	207	270	Plant filing fee	
108	790	208	395	Reissue filing fee	
114	150	214	75	Provisional filing fee	
SUBTOTAL (1)				(\$)	395

2. CLAIMS

Total Claims	Extra	Fee from below	Fee Paid
8	-20	= 0	(\$0)
Independent Claims	1	- 3	= 0
Multiple Dependent Claims	0		(\$0)

Large Entity Small Entity

Fee Code (\$)	Fee (\$)	Fee Code (\$)	Fee (\$)	Fee Description
103	22	203	11	
102	82	202	41	Independent claims in excess of 3
104	270	204	135	Multiple dependent claim
109	82	209	41	Reissue independent claims over original patent
110	22	210	11	Reissue claims in excess of 20 and over original patent
SUBTOTAL (2)				(\$ 395.00)

3. ADDITIONAL FEES

Large Entity	Small Entity	Fee Code (\$)	Fee (\$)	Fee Description	Fee Paid
Fee	Fee	Fee	Fee	Fee	
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for reexamination	
112	920*	112	920*	Requesting publication of SIR prior to Examiner action	
113	1,840*	113	1,840*	Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for reply within first month	
116	400	216	200	Extension for reply within second month	
117	950	217	475	Extension for reply within third month	
118	1,510	218	755	Extension for reply within fourth month	
128	2,060	228	1,030	Extension for reply within fifth month	
119	310	219	155	Notice of Appeal	
120	310	220	155	Filing a brief in support of an appeal	
121	270	221	135	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,320	241	660	Petition to revive - unintentional	
142	1,320	242	660	Utility issue fee (or reissue)	
143	450	243	225	Design issue fee	
144	670	244	335	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	50	123	50	Petitions related to provisional applications	
126	240	126	240	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	
146	790	246	395	Filing a submission after final rejection (37 CFR 1.129(a))	
149	790	249	395	For each additional invention to be examined (37 CFR 1.129(b))	

Other fee (specify) _____

Other fee (specify) _____

* Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$ 40.00)

SUBMITTED BY

Complete if applicable

Typed or Printed Name	Joseph A. Naughton	Reg. Number	19,814
Signature	Joseph A. Naughton	Date	4/16/98
		Deposit Account User ID	23-3030

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PATENT APPLICATION FEE DETERMINATION RECORD					Application or Docket Number 4090-126			
CLAIMS AS FILED - PART I (Column 1) (Column 2)					SMALL ENTITY	OR OTHER THAN SMALL ENTITY		
FOR		NUMBER FILED	NUMBER EXTRA	RATE	FEE	RATE	FEE	
BASIC FEE (37 CFR 1.16(a))					\$ 395	\$ _____		
TOTAL CLAIMS (37 CFR 1.16(c))		8	minus 20 =	* 0	x \$ _____ =	0	\$ _____	
INDEPENDENT CLAIMS (37 CFR 1.16(b))		1	minus 3 =	* 0	x _____ =	0	\$ _____	
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(d))					+ _____ =	\$ _____		
* If the difference in column 1 is less than zero, enter "0" in column 2					TOTAL	395	OR TOTAL	
CLAIMS AS AMENDED - PART II (Column 1) (Column 2) (Column 3)					SMALL ENTITY	OR OTHER THAN SMALL ENTITY	\$ _____	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE	ADDI- TIONAL FEE	RATE	ADDI- TIONAL FEE	
	Total (37 CFR 1.16(c))	*	Minus	**	=	x \$ _____ =	\$ _____	
	Independent (37 CFR 1.16(b))	*	Minus	***	=	x _____ =	\$ _____	
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(d))					+ _____ =	\$ _____		
(Column 1) (Column 2) (Column 3)					TOTAL ADDITIONAL FEE	TOTAL ADDITIONAL FEE		
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE	ADDI- TIONAL FEE	RATE	ADDI- TIONAL FEE	
	Total (37 CFR 1.16(c))	*	Minus	**	=	x \$ _____ =	\$ _____	
	Independent (37 CFR 1.16(b))	*	Minus	***	=	x _____ =	\$ _____	
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(d))					+ _____ =	\$ _____		
(Column 1) (Column 2) (Column 3)					TOTAL ADDITIONAL FEE	TOTAL ADDITIONAL FEE		
AMENDMENT C	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE	ADDI- TIONAL FEE	RATE	ADDI- TIONAL FEE	
	Total (37 CFR 1.16(c))	*	Minus	**	=	x \$ _____ =	\$ _____	
	Independent (37 CFR 1.16(b))	*	Minus	***	=	x _____ =	\$ _____	
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(d))					+ _____ =	\$ _____		
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".					TOTAL ADDITIONAL FEE	TOTAL ADDITIONAL FEE		
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.								

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BALL VALVE SEAL REPLACEMENT APPARATUS AND METHOD

BACKGROUND OF THE INVENTION

Field of the Invention:

This invention relates generally to ball valves, and more particularly to apparatus and a method for replacement of the downstream seal of such valves.

Description of the Prior Art:

Ball valve assemblies are widely used in piping systems. Typically they have a valve body with a passageway through it and which opens at opposite flanged faces of the valve body, with the opening at the center of the face and a large flange with bolt receiving holes by which the valve body can be bolted to flange piping. Such valves are often used in a system in which the flow is usually in one direction from an upstream, higher pressure side to a downstream side. However, it is not uncommon for ball valves to be used in systems in which the pressure differential across the valve can be in opposite directions at different times.

When such valves are used on fittings to enable supply of material to or removal of material from a tank, such as on a tanker truck or railroad car, occasions arise when it is desirable to replace one or both seals. If the application is in a tanker wherein there is piping or a hose external to the valve assembly to supply material to the tank or remove it from the tank, but not always in place, it is desirable to be able to replace the outboard valve seal without emptying the tank. In other words, it is desirable to be able to replace the outboard seal even if there is pressure in the tank. Heretofore, to the best of my knowledge, that has not been possible in conventional ball valve assemblies, without removing the pressure from the tank. In many instances, has necessitated draining the product from the tank before seal replacement. Therefore, it is an object of the present invention to facilitate removal of the outboard seal from a ball valve assembly, and replacement of the seal, while the tank or plumbing line upstream of the valve body remains pressurized.

SUMMARY OF THE INVENTION

Described briefly, according to a typical embodiment of the present invention, a jig is mounted to the downstream flange of the valve body of a conventional ball valve assembly. The jig includes a mounting frame bolted to the flange and which has two independently movable, primary and secondary abutments pivotally mounted to the frame. A screw is provided with a torquing tool receiver at one end and a valve ball engagement pad at the other end, a couple of bearings on the screw shaft intermediate the ends, and a nut associated with each of the bearings. The screw is positioned with the pad engaging the ball and the screw is oriented with its axis along the axis of the valve body passageway sealed by the ball. With the primary abutment in place, centered on the axis of the screw, the primary bearing is placed against the abutment, between the pad and the abutment and, while holding the screw head from rotating, the primary nut is turned on the screw to jam the nut against the bearing and thereby force the pad on the ball and thereby force the ball against the inboard valve seal, whereby the ball will seal against the inboard valve seal and will hold pressure upstream of the valve. Then the outboard valve seal retainer ring is removed and so is the outboard valve seal, up to a position above the secondary bearing and nut. Then the secondary abutment is swung into place adjacent the screw axis and under the retainer and valve seal and above the valve ball. The secondary bearing is moved against the secondary

abutment and, while holding the screw from rotating, the secondary nut is turned into position bearing against the secondary bearing. The nut is further turned while the screw is held from rotation, to jam the secondary bearing against the secondary abutment and simultaneously apply additional force to hold the valve ball on the inboard seal. At this time, of course, the outboard seal retainer ring and the removed outboard ball seal and retainer seal have been placed in position between the secondary and primary abutments. Then, with the secondary abutment secure in place and retaining the ball against the inboard seal, the primary nut is loosened and the primary abutment is swung out of place. Then the seal retainer ring and outboard seal are removed from the tool receiver end of the screw. A new seal is installed on the screw followed by the seal retainer ring. Then the primary abutment is swung back into place, and the primary nut and bearing are tightened against it to again apply axial force on the screw. This is followed by loosening the secondary nut, swinging the secondary abutment out of place and installing the new seal in the valve body against the ball. Then the seal retainer ring is installed in the valve body to hold the new outboard seal snugly against the ball. Then the primary nut can be loosened, the primary abutment swung out of the way, and the screw removed. Then the frame can be removed and any downstream piping can be re-installed on the downstream flange.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side elevational view of the apparatus of the present invention mounted on a ball valve assembly shown in axial section.

Fig. 2 is a top plan view thereof taken at line 2-2 in Fig. 1, viewed in the direction of the arrows and omitting the head end of the jam screw.

Fig. 3 is a view similar to Fig. 1 showing the ball seal retainer, the retainer seal and the valve ball seal removed from the valve body.

Fig. 4 is a similar view showing the step prior to removal from the jam screw.

Fig. 5 is a view showing the apparatus after removal of the retainer, the retainer seal and ball seal from the jam screw.

Fig. 6 is a view showing a new ball seal and retainer seal installed in the valve body.

Figs. 7-12 are like Figs. 1-6 but for another embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

For the purposes of promoting an understanding of the principles of the invention, reference will now be made to the embodiment illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended, such alterations and further modifications in the illustrated device, and such further applications of the principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

Referring now to the drawings in detail, and particularly Fig. 1, a valve body assembly designated by bracket 11 is of typical construction including the valve body itself 12, having upper and lower flanges 13 and 14, having four bolt holes such as 16 (Fig. 2) circularly spaced around the axis 17. These flanges are arranged for assembly with pipe flanges on components as of pipes in a piping system, with appropriate seals between the valve body flanges and the associated pipe flanges as is well known in the art.

While there is a considerable variety of ball valve assemblies available, the one illustrated here is somewhat simplified simply for purposes of example. It has two units 18 and 19 in it, each of which can serve as both a ball seal and a ball bushing. The first seal 18 is received on top of the ball

20 in the main bore of the valve body. The second seal 19 is received under the ball and rests on the bottom of the bore.

The valve ball 20 is shown in the closed position with the aperture 21 thereof transverse to the axis 17 of the valve body bore. The operating stem 22 for the valve ball is inserted in the valve body from inside the main bore before the valve ball 20, with inboard stem seals 23 received in the stem head retainer counterbore. The valve ball has a slot 24 receiving the squared head of the stem 22. Packing 25 at the outboard region of the stem is engaged by the stem collar 26 and can be tightened by the inboard nut and washer combination 27 threaded on the stem 22. The inboard washer has flats matching the flats on the stem. The adjustment can be secured by tightening the outboard nut and washer combination on the stem.

As suggested above, the particular construction of the valve assembly is not the invention, so is only illustrated schematically. Upon loosening the nuts on the valve shaft, the ball can be turned 90° about the stem axis 30 to place the aperture 21 in the passage for flow of fluid in the direction of arrow 28 from the inlet opening 29 to the outlet opening 31 of the valve assembly.

To facilitate understanding of the utility of the invention, and as only an example, consider as in Fig. 3, that the flange 14 is mounted to a pipe flange 66 on a tank 67 containing a liquid 68 or gas under pressure. While the

invention is useful regardless of the attitude of the ball valve assembly, it is shown in an upright attitude to facilitate description. The terms such as "above" and "below" should not be construed as limiting the usefulness of this invention to a ball valve assembly only when disposed as shown in the illustrations herein.

With the foregoing in mind, and assuming that the flange 14 is mounted to a flange on a pipe or vessel at a higher pressure than a pipe or container mounted to flange 13, and since the tendency of liquid or vapor contents under such conditions would be to pass in the direction of arrows 28, flange 14 will be referred to as the inlet flange with the lower face thereof being the inlet face. Similarly, flange 13 will be referred to as the downstream flange and the top face of that, the downstream face. Valve seal 18 is the outboard, high pressure seal, and seal 19 is the inboard, low pressure seal, in this context. These seals may be identical, and may be made of a low friction sealing material of Teflon brand or other suitable material such as well known in the art.

Under normal operating conditions, the seal 18 is holding the pressure in the tank or fitting at the flange 14, while seal 19 may merely serve in a somewhat floating role as a bushing for the valve ball 20. Seal 18 is retained in the bore 33 by a seal retainer ring 34 which is screwed into the outlet face of the valve body. A retainer seal ring 36 prevents

leakage out along the ring 34 threads when the valve is open. Because it is the seal 18 which prevents leakage of the vapor, gas, or contents in the piping or vessel connected to flange 14, it is most important that it properly seal against the ball when the valve is closed. Therefore, if it becomes worn or damaged, it must be replaced.

Normally, it is necessary to remove the pressure from the ball valve assembly in order to replace valve seal 18. In many applications, that is not convenient, especially if there are no other upstream valves, or if this valve assembly is associated with a vessel and is at an elevation lower than a liquid product contained in the vessel. Therefore, the present invention provides a way to change the seal 18 without removal of pressure from the upstream side.

The apparatus according to the present invention includes a frame having a base 41 fastened to flange 13 by three cap screws 42 received through three of the four bolt holes 16 and screwed into the base 41. The base has three mounts 46, 47 and 48 for a shaft 49 having an axis 51. This shaft serves as a pivotal mounting for a primary abutment arm 52 and a secondary abutment arm 53, both of which are an inverted L-shape, and each of which can be pivoted down in the direction of arrow 54 (Fig. 2) from the upright position shown in Fig. 1 to a horizontal position resting on the top of the base 41 at 52A and 53A, respectively (Fig. 2).

A jam screw 56 has a socket 57 swivel mounted at the lower end and with a ring-shaped pad 58 made of a non-marring material engageable with the valve ball 20 and self-centering on the ball.. There are two washer and nut combinations mounted on the screw. The primary combination includes the nut 59 and washer 61. The secondary combination includes the nut 62 and washer 63. The washers serve as bearings between the nuts and the bottom face of the distal end of the respective abutment arm. The distal end of each of the primary and secondary arms 52 and 53, respectively, is formed with a yoke as at 52B in Fig. 2, which is generally U-shaped and close to the screw 56, but enables the arm to be swung down by moving it in the direction of arrow 54 about the axis 51, while the screw 56 remains in line with the valve passageway axis which, in the illustrated embodiment, is perpendicular to the bolt flange faces.

Referring now to Figs. 1 and 3, the valve body assembly is bolted to the flange 66 of the railroad tank car 67 shown fragmentarily and having a volatile material 68 therein. In Fig. 3, the seal 18 has been pulled out using the apparatus and method of the present invention. For that purpose, after bolting the base 41 to flange 13, the secondary arm 53 is lowered onto the top 53A of the base by moving it in the direction of the arrow 54 (Fig. 2). The primary arm 52 is tightly engaged with the upper (primary) bearing washer 61 by

screwing the primary nut 59 up on the screw 56, while the tool receiving head 65 is held with a wrench or otherwise, so that the screw 56 and lower end pad 58 does not turn, and the nut 59 can be tightened. As it does so, the screw is driven down tight against the ball 20, pushing it tightly against the seal 19, whereby both the ball and the shoulder 23 are tightly engaged by the seal 19 and thereby seal the valve body to the tank car and will hold any pressure therein from leaking past the ball, either upwardly in the direction of arrow 28, or outwardly past the seal 23 and packing 25 in the direction of the ball actuating shaft axis 30. Then, the spanner wrench pockets 34P (Fig. 2) in the top of the retainer ring 34, are engaged by an appropriate standard tool to loosen and unscrew the retainer ring from the valve body.

After the retainer ring has been pulled out, it can be held up out of the way, while still encircling the screw 56, as the retainer ring seal 36 is pulled out of the valve body and then the valve seal 18 can be pulled out of the valve body. All three of these items remain trapped by the screw 56 and arm 52. Of course, the two seals 18 and 36 could be cut away from the screw, as they may be discarded anyway, but not the retainer ring 34.

Then, with the three items held by a hand or wire or any convenient means, above the secondary nut and washer 62 and 63, the secondary arm 53 is swung back up about the axis 51 to

place its yoke around screw 56. Then the secondary nut 62 is turned up against the secondary washer 63 and thereby jams the washer against the distal end of arm 53 as the screw head 65 is held against turning by a wrench or otherwise. As soon as enough force has been applied by jamming the nut 62 against the washer 63 to keep the valve ball 20 tightly engaged with the seal 19, the primary nut 59 can be screwed down on the screw while the head 65 is held by a wrench, enabling the primary arm 52 to be swung down in the direction of arrow 54 about the axis 49 to rest on the base top at 52A. This is the condition shown in Fig. 5 whereupon the retainer ring 34 and seals 36 and 18 can be pulled off the top of the screw 56 as shown in Fig. 5. It should be understood, of course, that both of the nut and washer combinations on screw 56 are small enough in overall diameter, for the inner circumferential surfaces of the seals 18 and 36, and retainer ring 34, to clear them as they are pulled up along the screw and over the nut and washer combinations.

Then, new seals 18N and 36N and the retainer ring 34 can be lowered over the screw head and down around the screw 56 to the same position as shown in Fig. 4 resting on top of the secondary arm 53. Then the primary arm 52 is raised again and the primary nut 59 is jammed up against the primary washer 61 against the primary arm to again apply sufficient force to hold the ball 20 against the inboard seal 19, so that the secondary

arm 53 can again be released by turning the secondary nut 62 down on the screw and lowering the arm 53 in the direction of arrow 54 in Fig. 2. Then the two new seals can be lowered around the nut and washer combination 62, 63 and into the valve body, and the retainer ring 34 can follow and be screwed into the valve body to retain the seals in place. The retainer ring 34 again forces the new outboard valve seal 18N against the top of the valve ball so that, when the nut 59 is turned downward while the screw head 65 is held, the new seal 18N will assume the role of preventing escape of fluid or gas from the valve body in the direction of arrow 28. Then the arm 52 can be lowered and the jig base 41 can be removed from the flange 13. Then whatever piping solid or flexible, or fixture had been connected to it before, can be re-installed on the flange 13. Thus, the valve seal which normally prevents leakage from the high pressure side to the downstream side has been replaced without depressurizing or emptying the high pressure side of the system or the tank or whatever it is to which the flange 14 remains bolted.

It should be understood that, while the illustrated primary and secondary abutment arms are mounted to pivot on a horizontal axis, they could be reconfigured and mounted to swing about an axis parallel to the screw. An example of this construction is shown in Figures 7-12. In these views the components which are the same as in Figs. 1-6, have the same

reference numerals. Other components which are not necessarily the same but have similar functions, are given similar reference numerals but with the digit "1" in front. Post 149 is screwed into base 141 and has collars 147 and 148 supporting arms 152 and 153, respectively. The operating procedure is basically the same as described above.

The present invention is also useful to make it easy to replace valve stem packing 25 at the same time that the outboard valve ball seal is replaced, because the inboard ball seal is holding pressure away from the valve stem. If it is not necessary to replace the outboard ball seal, but is necessary to replace stem packing while the valve is pressurized, the present invention is useful. In that event, only one or the other of the abutment arms need be used.

With the foregoing in mind it should be recognized that, while the invention has been illustrated and described in detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character, it being understood that only the preferred embodiments have been shown and described, and that all changes and modifications that come within the spirit of the invention are desired to be protected.

What is claimed is:

1. With a ball valve assembly having: a valve body including an inlet face with a mounting flange and an inlet, and an outlet face with a mounting flange and an outlet, and a passageway therethrough from the inlet to the outlet, and a valve ball in the passageway and operable to close the passageway thereby dividing the passageway into an inlet passageway and an outlet passageway, and first and second seals engaging the valve ball at the outlet passageway and the inlet passageway, respectively, and a seal retainer ring received in the outlet passageway and normally retaining the first seal against the valve ball in the body, and the body having mounting holes in the flanges, apparatus for replacing the second seal and comprising:

a base having a mounting face with mounting holes spaced for registry with at least two of the mounting holes in the outlet face flange;

first and second arms pivotally mounted to the base, each of the arms having active and rest positions, and each of the arms having a distal end with a recess therein;

a screw having a pad at the lower end and having a tool receiver at the upper end and having two nuts threadedly received thereon and operable to load the arms when in their active positions, the recesses on the distal ends of the arms being sized to receive the screw therein.

2. A method of removing the first seal from the ball valve assembly of claim 1 and comprising the steps of:

attaching the mounting face of the base to the outlet face of the valve body;

placing the lower end of the screw on the valve ball;

placing the distal end of the first arm directly above the ball;

placing the recess in the distal end of the first arm;

moving the first bearing against the bottom of the distal end of the first arm at the screw;

turning the nut while holding the screw to jam the screw pad against the ball and thereby jam the ball against the second seal to seal closed the inlet passageway;

removing the seal retainer ring from the valve body;

removing the first seal from the valve body;

placing the distal end of the second arm in position under the retainer ring and above the ball;

turning the second nut while holding the screw to continue to jam the screw pad against the ball and thereby cooperate with the first arm and screw to jam the ball against the second seal to maintain second seal closure of the inlet passageway;

loosening the first nut enough to enable movement of the distal end of the first arm away from the screw;

and removal of the retainer ring from the screw.

3. The method of claim 2 and further comprising the step of:

placing the first seal above the distal end of the second arm before moving the distal end of the second arm into position above the ball.

4. The method of claim 3 and further comprising the step of:

removing the first seal from the screw after removing the retainer ring from the screw.

5. The method of claim 2 and further comprising the step of:

removing the first seal.

6. The method of claim 5 and further comprising the steps of:

installing a replacement seal on the screw above the distal end of the second arm;

re-installing the retainer ring on the screw above the replacement seal;

returning the distal end of the first arm into position over the ball and adjacent the screw and above the replacement seal and the retainer ring;

turning the first nut while holding the screw to again enable the first arm to jam the screw pad against the ball and thereby cooperate with the second arm and screw to jam the ball against the second seal to continue to seal closed the inlet passageway;

loosen the second nut enough to enable movement of the distal end of the second arm away from the screw;

lower the replacement seal into position in the valve body against the valve ball; and

return the retainer ring into position in the valve body against the replacement seal.

7. The method of claim 6 and further comprising the steps of:

releasing the first nut and removing the screw.

8. The method of claim 7 and further comprising the step of:

removing the base from the outlet face of the valve body flange.

ABSTRACT OF THE DISCLOSURE

While fluid pressure is present on the upstream side of a ball valve assembly, a jig is mounted to the downstream flange of the ball valve assembly. The jig has two hinged arms. A jack-screw pad engages the ball while one or the other of the arms is positioned at the screw and urged by a jam nut on the screw to force the pad against the valve ball to seal it on the inboard valve seal. Then the outboard seal is removed and replaced during sequential use of the hinged arms to keep the inboard seal holding pressure on the upstream side.

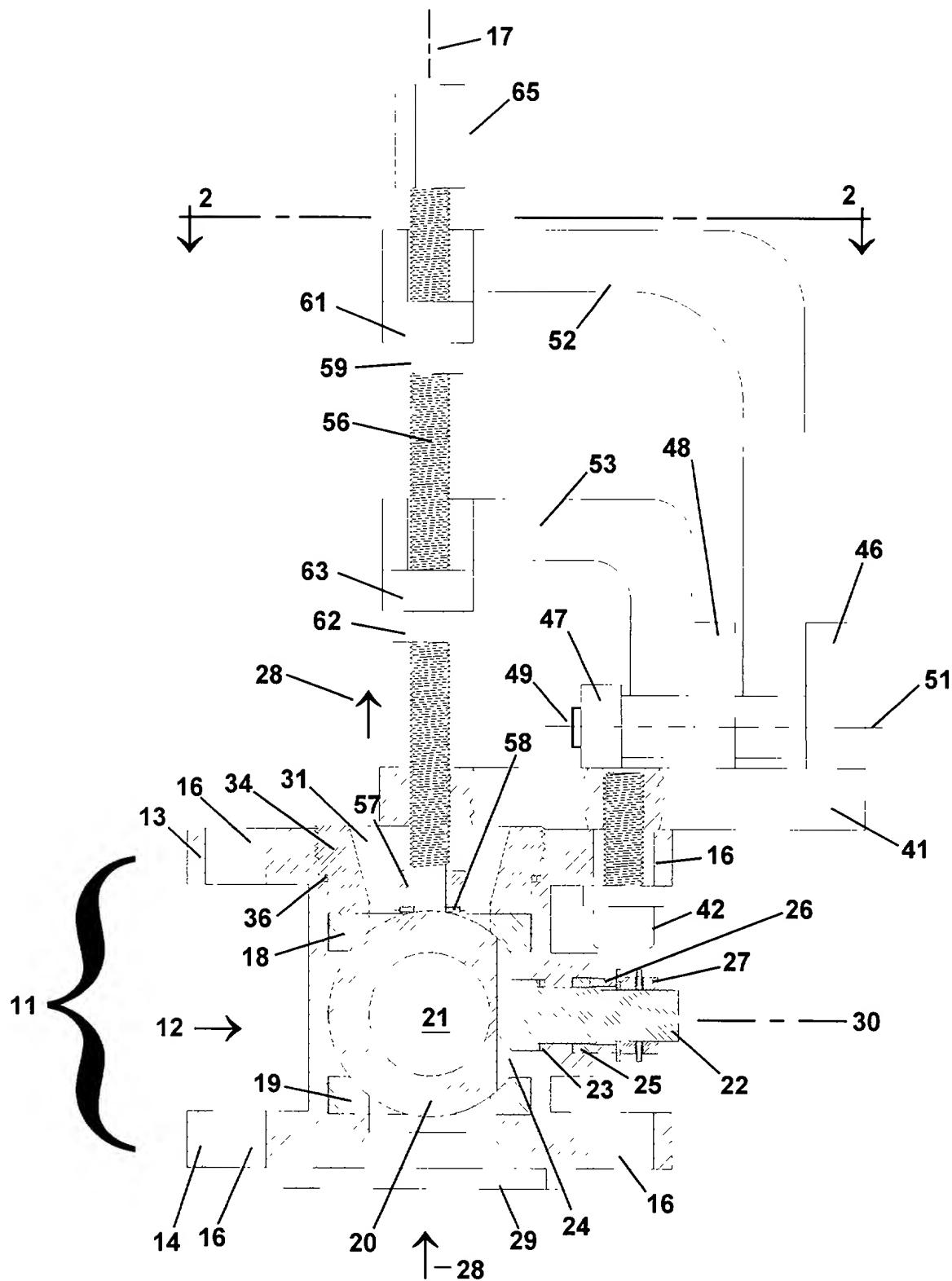


FIG. 1

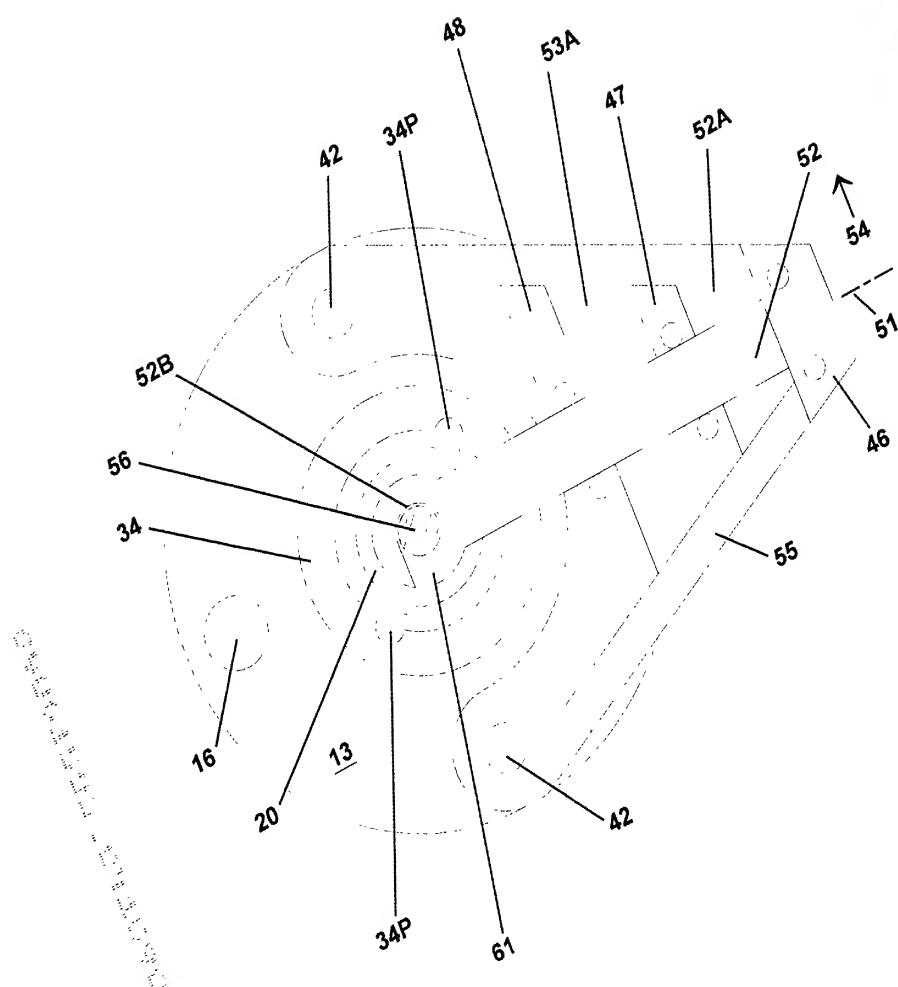


FIG. 2

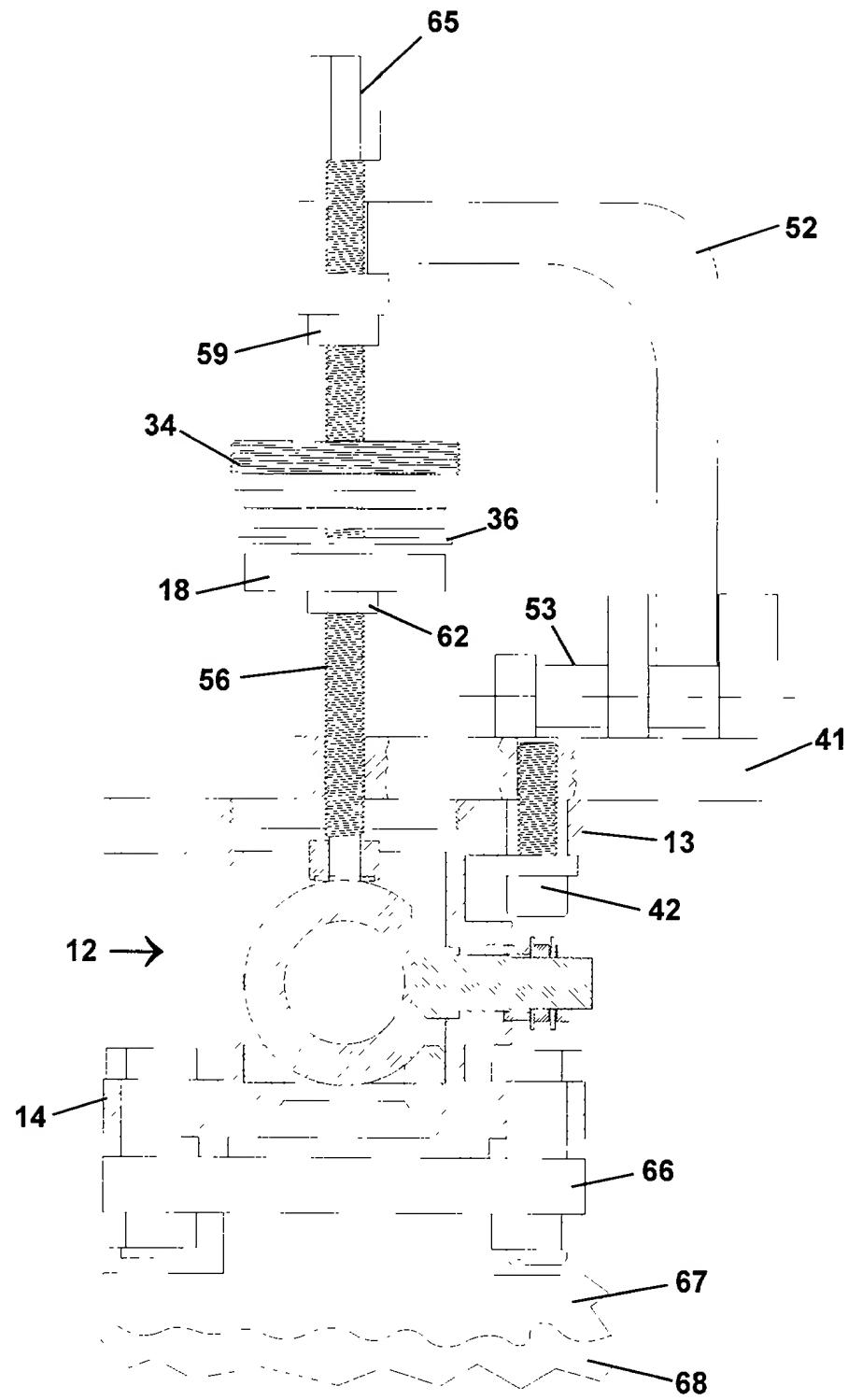
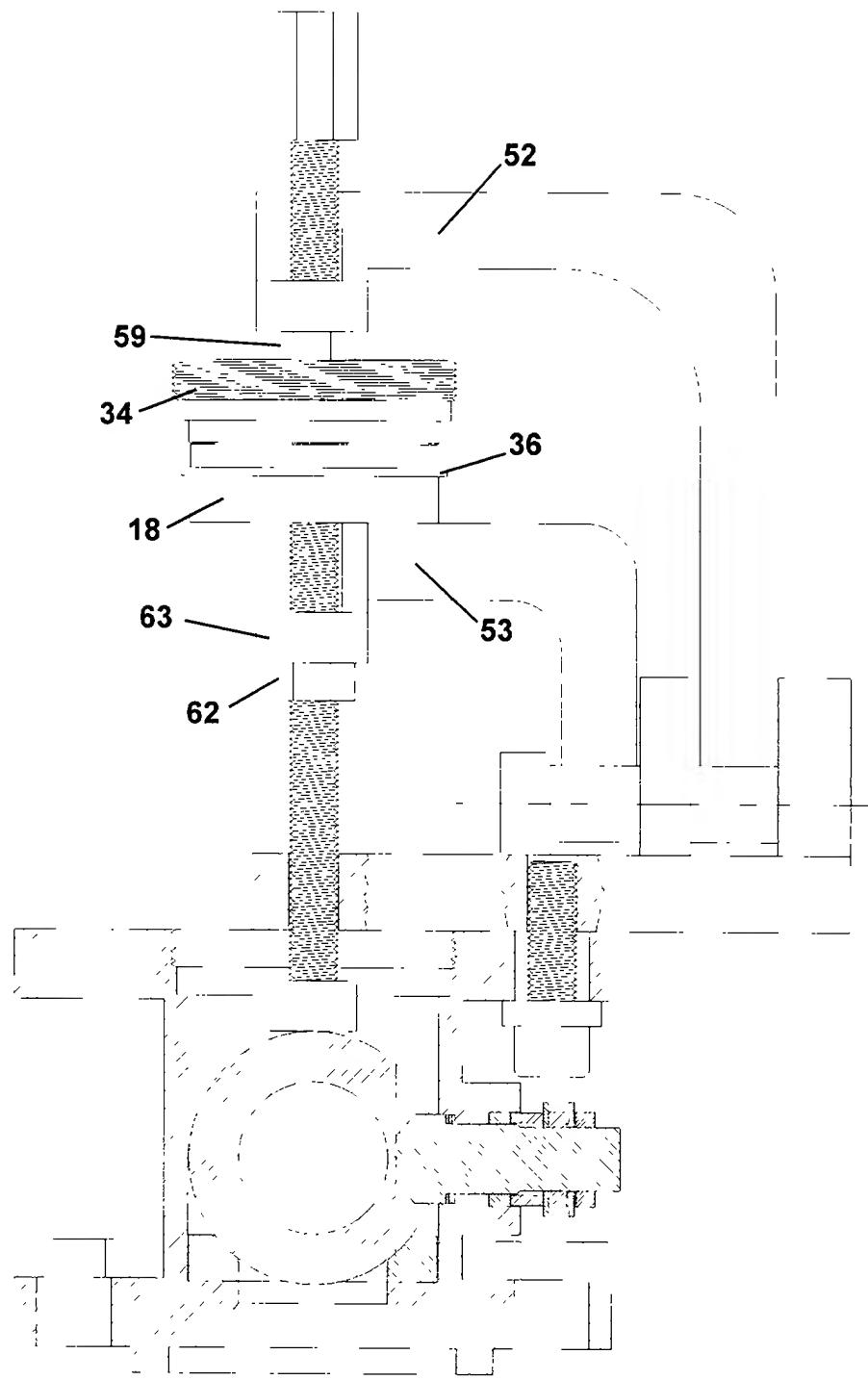


FIG. 3



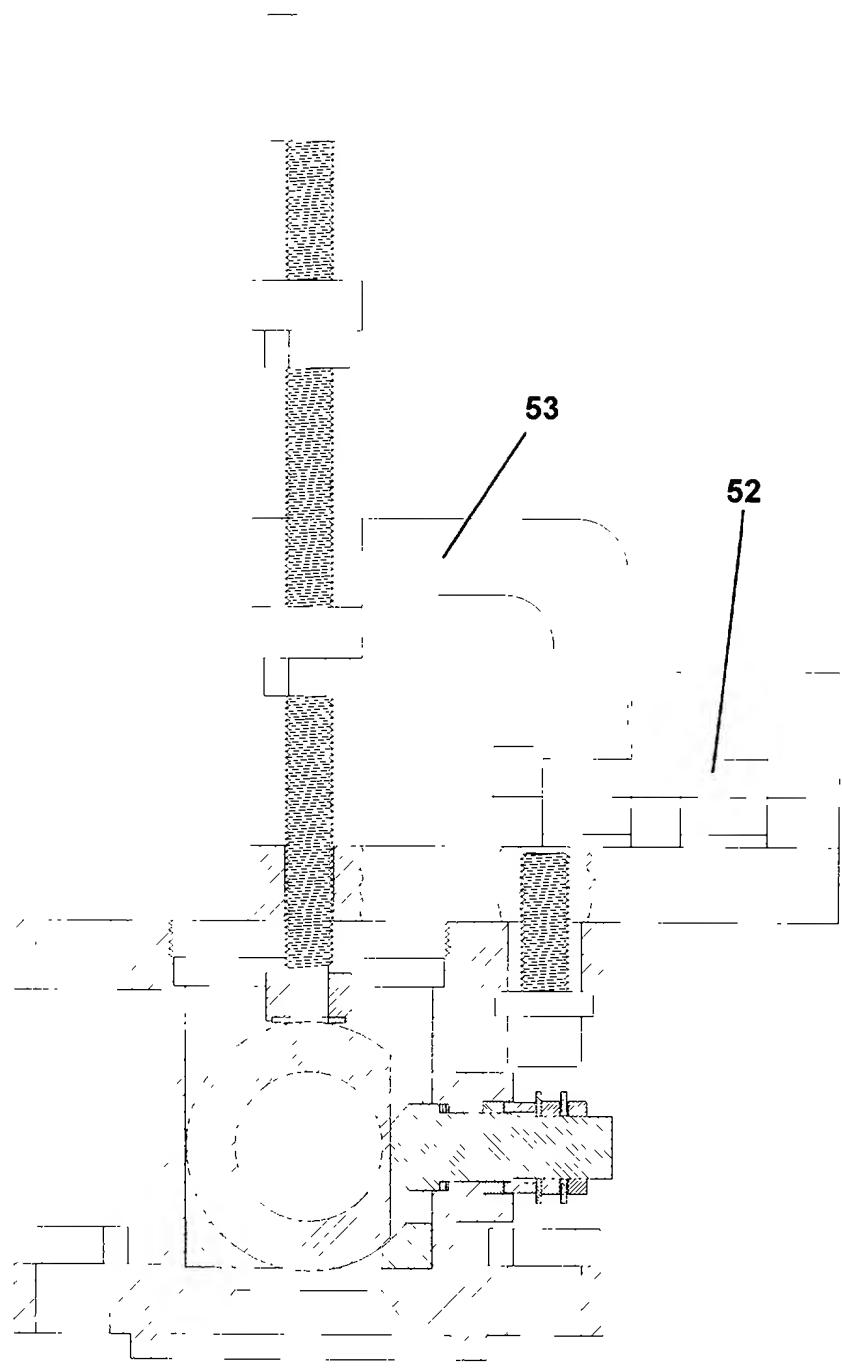


FIG. 5

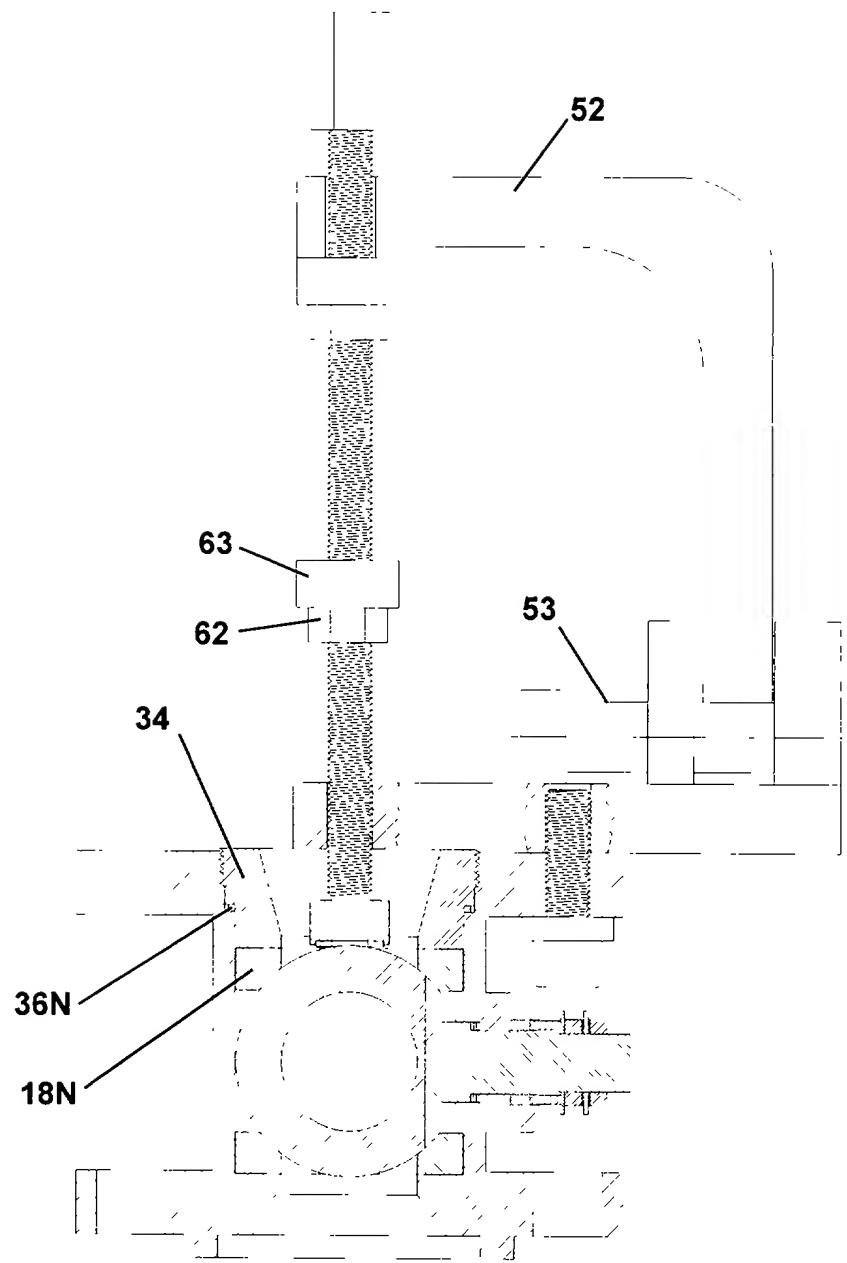
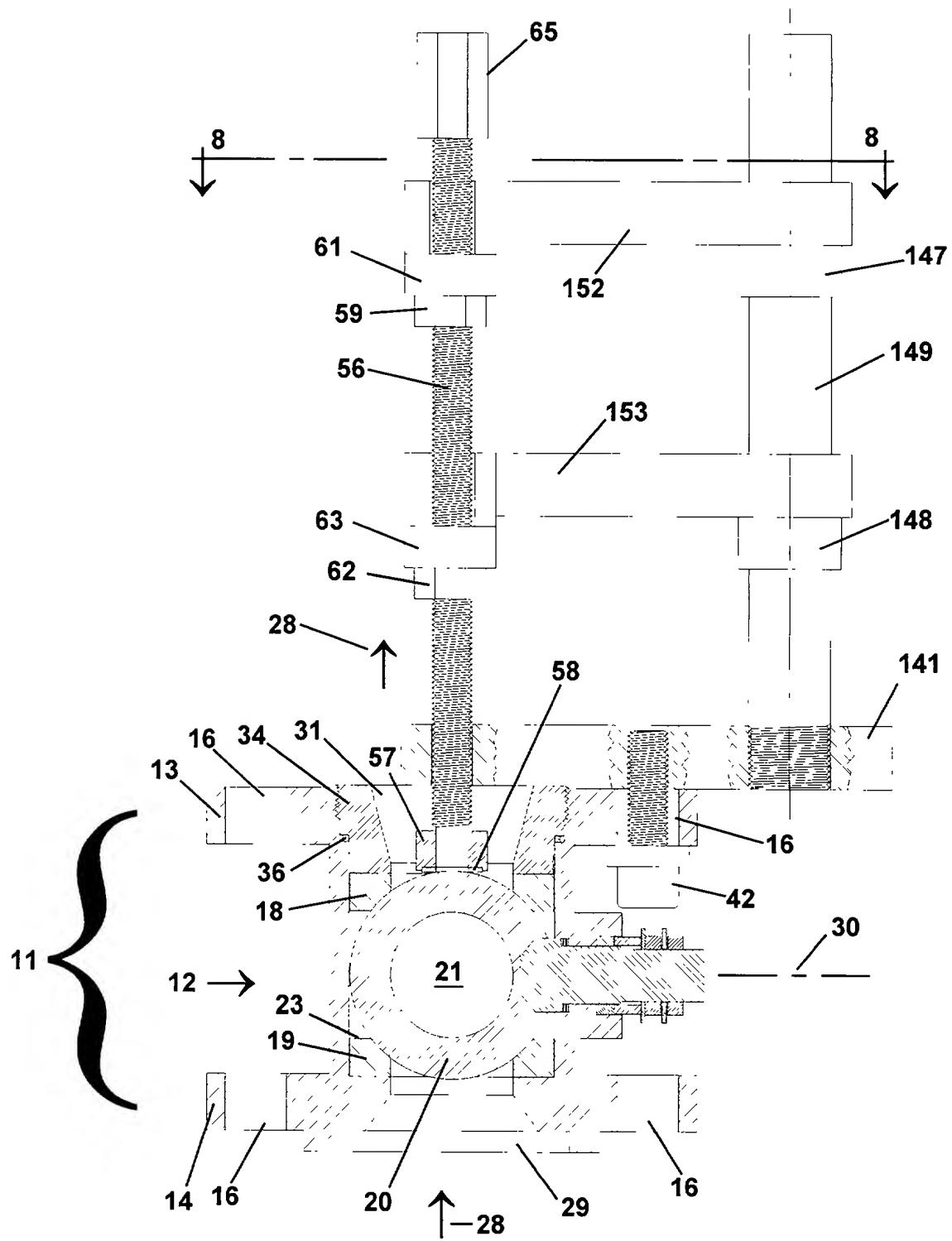


FIG. 6



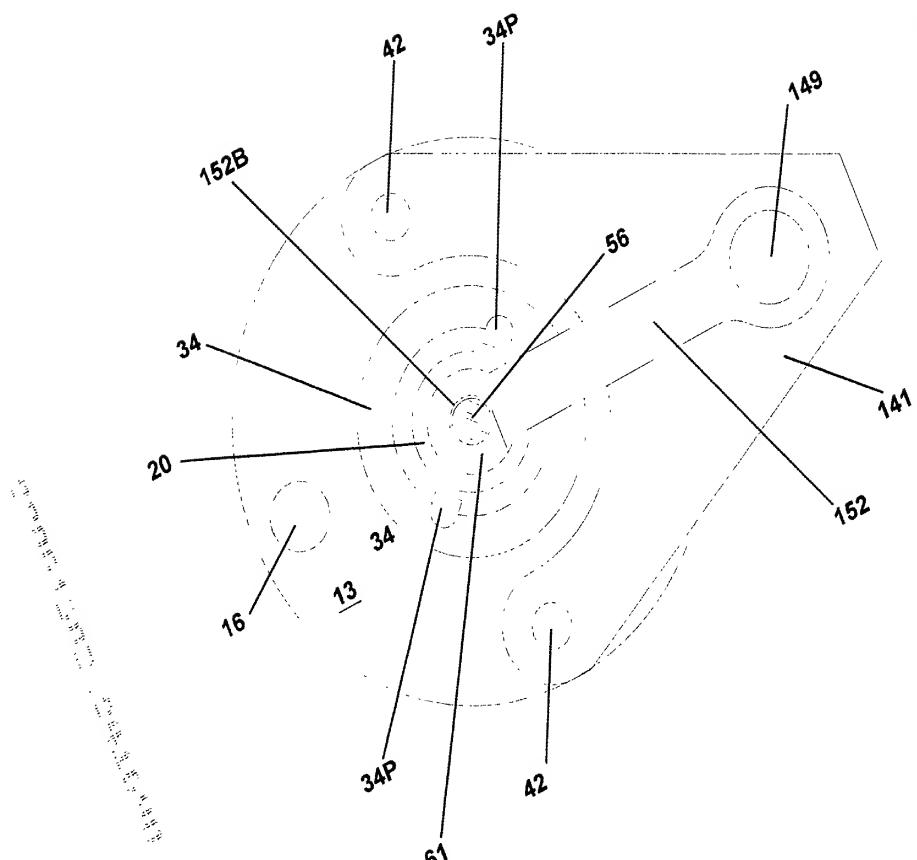


FIG. 8

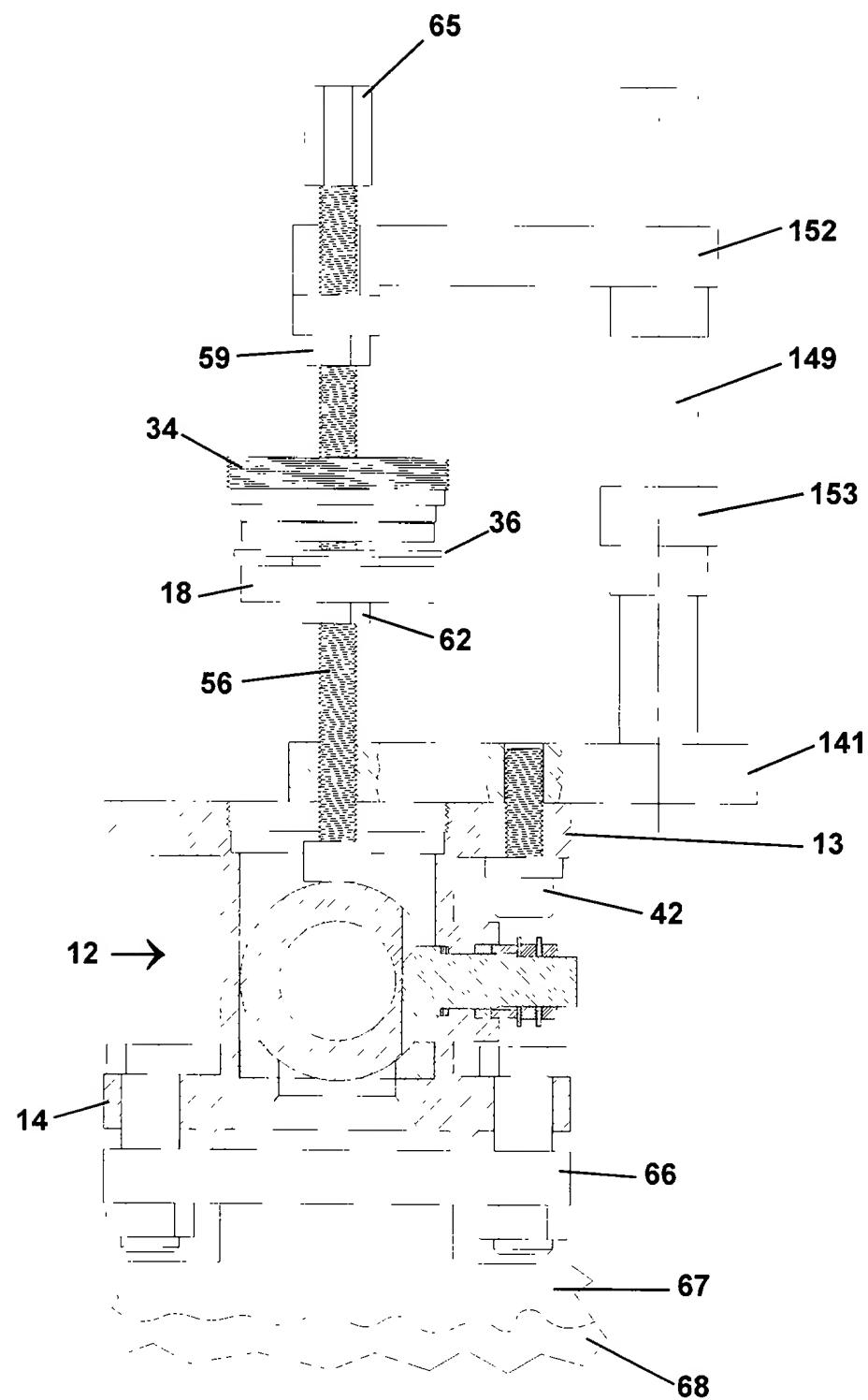


FIG. 9

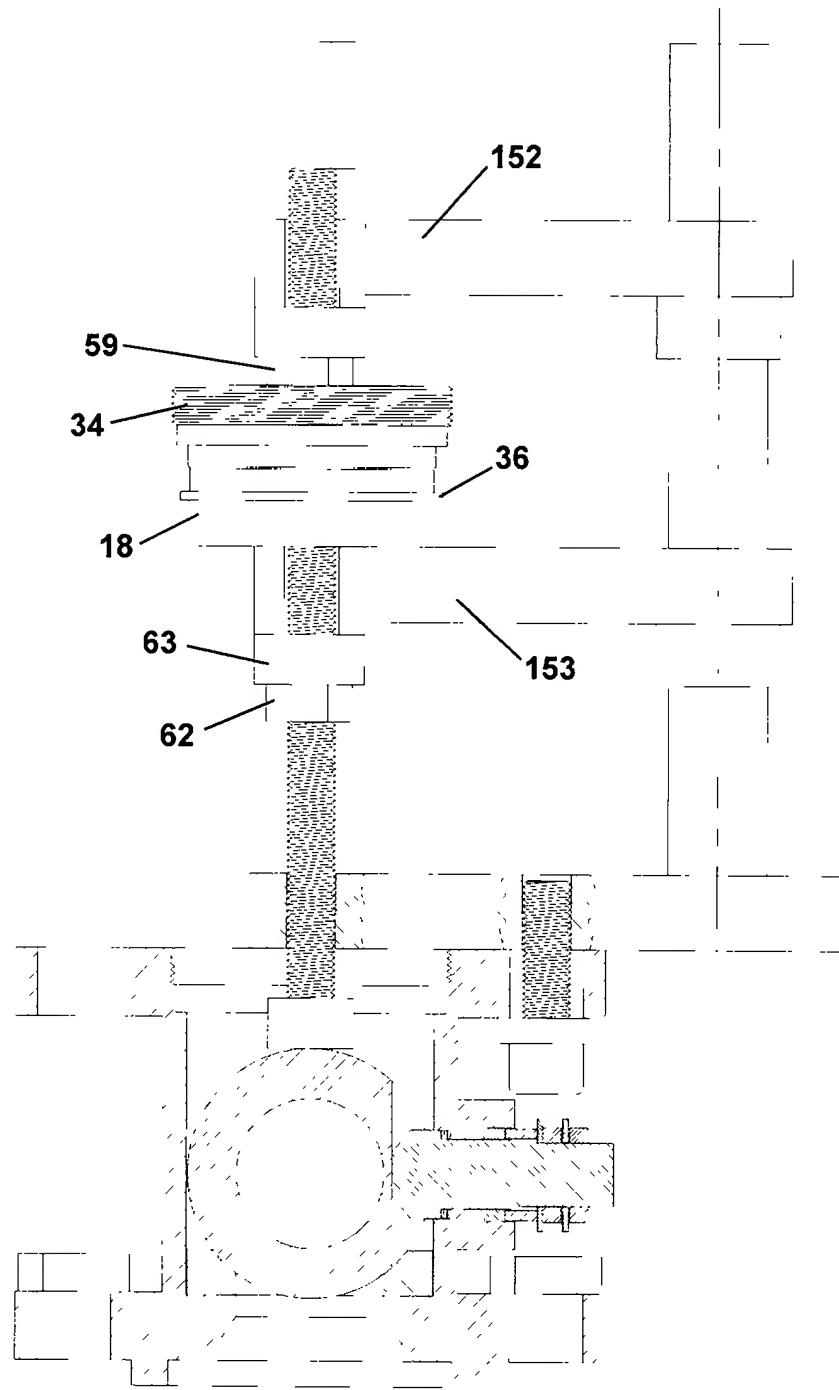


FIG. 10

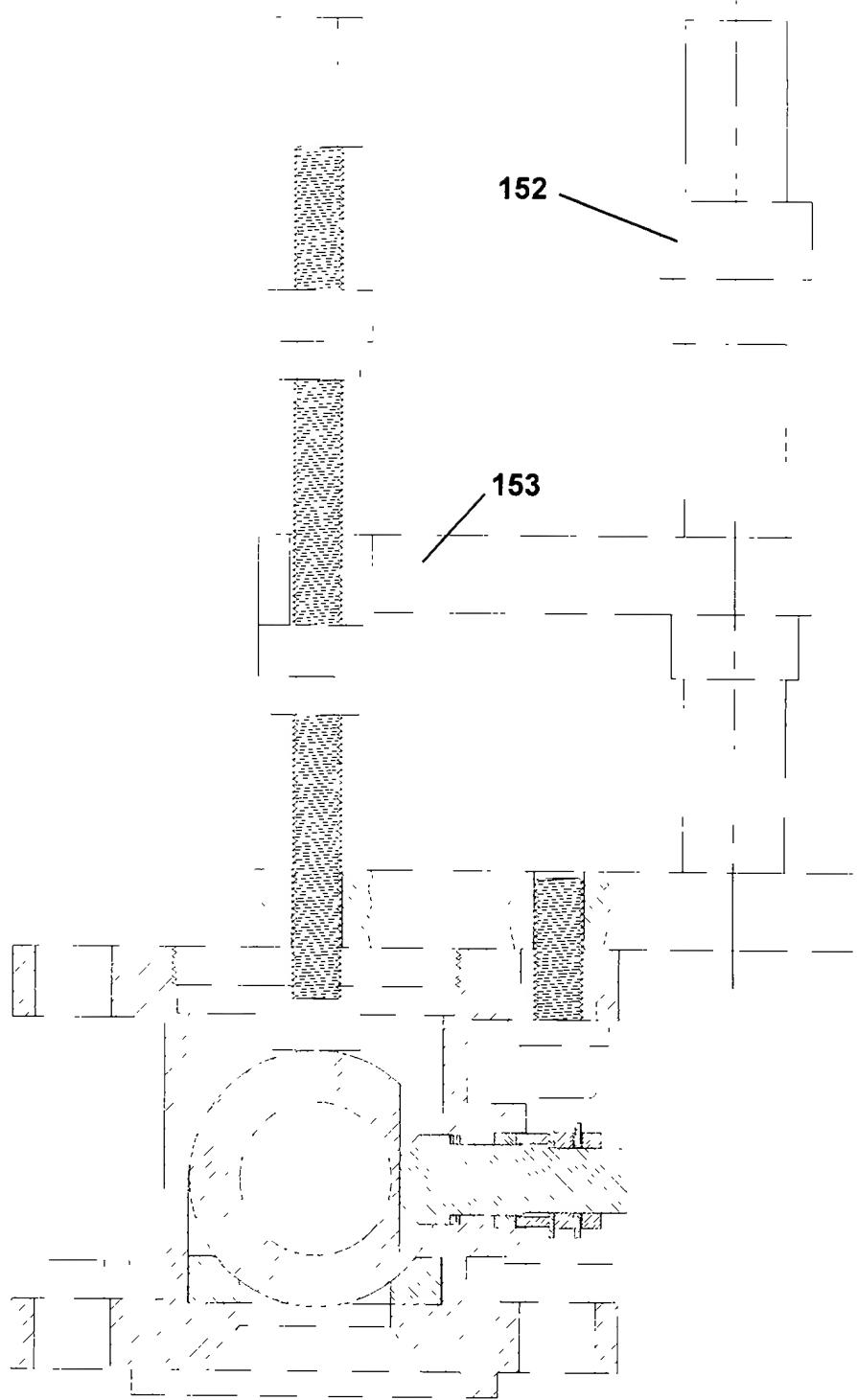


FIG. 11

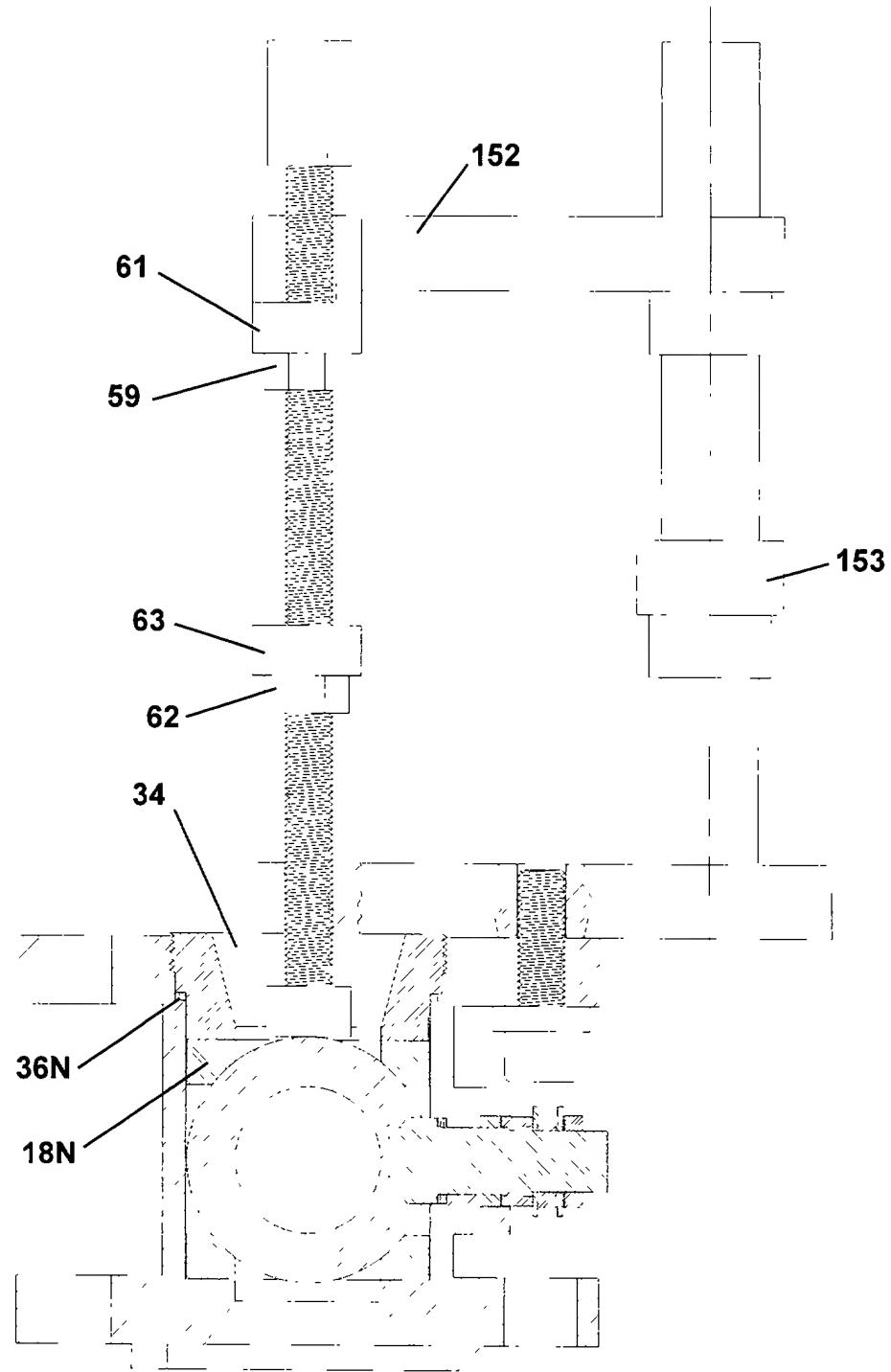


FIG. 12

DECLARATION AND POWER OF ATTORNEY
FOR PATENT APPLICATION

Docket No. 4090-126

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **BALL VALVE SEAL REPLACEMENT APPARATUS AND METHOD** the specification of which

(check one) is attached hereto.

was filed on _____ as Application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)	Priority Claimed
------------------------------	------------------

(Number)	(Country)	(Day/Month/Year Filed)	Yes	No
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I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status-pat./pending/abandoned)
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(Application Serial No.)	(Filing Date)	(Status-pat./pending/abandoned)
--------------------------	---------------	---------------------------------

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: Harold R. Woodard, No. 16,214; C. David Emhardt, No. 18,483; Joseph A. Naughton, No. 19,814; Jack V. Moriarty, No. 26,207; John Cameron McNett, No. 25,533; Thomas Q. Henry, No. 28,309; James M. Durlacher, No. 28,840; Charles R. Reeves, No. 28,750; Vincent O. Wagner, No. 29,596; Steve Zlatos, No. 30,123; Spiro Bereveskos, No. 30,821; William F. Bahret, No. 31,087; Clifford W. Browning, No. 32,201; R. Randall Frisk, No. 32,221; Daniel J. Lueders, No. 32,581; Kenneth A. Gandy, No. 33,386; Timothy N. Thomas, No. 35,714; Kerry P. Sisselman, No. 37,237; Kurt N. Jones, No. 37,996; John H. Allie, No. 39,088; Holiday W. Banta, No. 40,311; Troy J. Cole, No. 35,102; L. Scott Paynter, No. 39,797; J. Andrew Lowes, No. 40,706; Charles J. Meyer, P-41,996; Darrin W. Harris, No. 40,646; Matthew R. Schantz, No. 40,800; Gregory B. Coy, No. 40,967; Lisa A. Hiday, No. 40,036; John V. Daniluck, No. 40,581; Christopher A. Brown, P-41,642; and Arthur J. Usher IV, No. 41,359

Address all telephone calls to: Joseph A. Naughton at 317-634-3456

Address all correspondence to: Joseph A. Naughton, Esq.

WOODARD EMHARDT NAUGHTON MORIARTY &
McNETT
Bank One Center/Tower
111 Monument Circle, Suite 3700
Indianapolis, Indiana 46204-5137

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor: Larry C. Wilkins

Inventor's Signature: L.C. Wilkins

Date 4/15/98

Residence: New Albany, Indiana

Citizenship: United States of America

Post Office Address: ~~1601 Heddon Court, New Albany, Indiana 47150~~

3115 Braz. 1 Lake Pkwy, Georgetown In. 47122

Full name of joint or second inventor:

L.W.

Inventor's Signature: _____

Date _____

Residence:

Citizenship:

Post Office Address:

3058n

APPLICANT OR PATENTEE: Larry C. Wilkins

SERIAL OR PATENT NO:

FILE OR ISSUE DATE:

TITLE: BALL VALVE SEAL REPLACEMENT APPARATUS
AND METHOD

ATTORNEY'S DOCKET NO. 4090-126

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9(f) and 1.27(b)) - INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled BALL VALVE SEAL REPLACEMENT APPARATUS AND METHOD described in

The specification filed herewith.

Application Serial No. _____, filed _____

Patent No. _____, issued _____

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e). Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

no such person, concern, or organization

persons, concerns or organizations listed below*

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

FULL NAME: Electromechanical Research Laboratories, Inc.

ADDRESS: P.O. Box 1026

New Albany, Indiana 47150

INDIVIDUAL SMALL BUSINESS CONCERN NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

4/15/98, 1998
Date of Signature

Larry C. Wilkins
Larry C. Wilkins

3058n

APPLICANT OR PATENTEE: Larry C. Wilkins

SERIAL OR PATENT NO:

FILE OR ISSUE DATE:

TITLE: BALL VALVE SEAL REPLACEMENT APPARATUS AND METHOD
ATTORNEY'S DOCKET NO. 4090-126

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS(37 CFR 1.9(f) and 1.27(c))- SMALL BUSINESS CONCERN

I hereby declare that I am

the owner of the small business concern identified below:
 an official of the small business entity empowered to act on behalf of the concern identified below:

NAME OF CONCERN: Electromechanical Research Laboratories, Inc.

ADDRESS OF CONCERN: P.O. Box 1026

New Albany, Indiana 47150

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for the purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled BALL VALVE SEAL REPLACEMENT APPARATUS AND METHOD, by inventors described in:

The specification filed herewith.
 Application Serial No. _____, filed _____.
 Patent No. _____, issued _____.

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who would not qualify as an independent inventor under 37 CFR 1.9(c) if that person made the invention, or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

FULL NAME:

ADDRESS:

INDIVIDUAL SMALL BUSINESS CONCERN NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful and false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

April 15, 1998
Date of Signature

L. C. Wilkins
Larry C. Wilkins
President